system capacity that will be available for service to these regions significantly exceeds COMSAT's current service to these markets.

By the end of 1996 at least seven separate system satellites will be able to provide switched voice and private line services to and from the U.S. in the AOR (PAS-l, PAS-3, TDRSS-East, Globostar-1, Gorizont 20, Gorizont 26, and Orion 1). Also, six separate system satellites will be able to provide switched voice and private line services to and from the U.S. in the POR (PAS-2, TDRSS-West, Rimsat, Pacificom-1, Gorizont 17 and Gorizont 24). Even if each satellite were restricted to provide no more than 1,250 64 kbps-equivalent circuits that are interconnected with public switched networks, these satellites in total could provide 8,750 circuits of switched voice services in the Atlantic Ocean Region and 7,500 circuits of switched voice services in the Pacific Ocean Region. [142]

Separate satellite systems are able to serve the markets that are not easily accessible by cable, In fact, the capacity of new separate satellite systems competes directly with COMSAT's 4,300 circuits of switched voice services to the geographic market segments with limited cable access in the AOR and POR (i.e., Rest of Latin America, Rest of the Atlantic Ocean Region, and Rest of the Pacific Ocean Region). This effectively precludes COMSAT from obtaining market power in the regions where current market shares arc still high.

In addition, once the restriction to 1,250 64 kbps-equivalent circuits is removed, separate satellite systems will be able to compete for switched voice services with all of their available capacity. For example, Columbia Communications is able to provide up to 3,300 64 kbps-equivalent circuits on NASA's TDRSS satellites in both the Atlantic and Pacific Ocean Regions. TRW will compete with up to 8,800 circuits in the POR. Rimsat will have 3,300 circuits available on its POR satellite that can reach the U.S. Orion would be able to provide up to 17,050 64 kbps-equivalent circuits on its AOR satellite and Globostar will have available 4,400 circuits on its satellite in the AOR. Finally, Intersputnik competes with approximately 3,800 circuits on both its AOR and POR Gorizont satellites that can reach the U.S.[143]

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[142] Note that COMSAT's total switched voice and private line circuits to all of the POR is less than 6,000 circuits. See Exhibit HSH-5.

[143] See Exhibit HSH-10.2.

Furthermore, in anticipation of serving the markets that are not easily accessible by cable, PanAmSat has specifically dedicated 8 64-MHz transponders on each of its new satellites to switched voice and private line services, providing a capacity up to 5,200 64 kbps-equivalent circuits per satellite. [144] Once these satellites are in operation, PanAmSat will be able to reach 98 percent of the world's population. Even if it is assumed that only half of this capacity is available for service to and from the U.S., separate systems will be able to compete with more than 15,000 64 kbps-equivalent circuits in the Atlantic Ocean Regions and almost as many circuits in the Pacific Ocean Regions.

Finally, some of the 30 U.S., Mexican, and Canadian domestic satellites may also enter the switched voice market in the near future.

CONCLUSIONS

The market for trans-oceanic telecommunication services to and from the U. S . has been growing rapidly. This rapid growth has facilitated greatly the entry of substantial amounts of new capacity in recent years and even more is planned.

COMSAT's share of existing and planned trans-oceanic telecommunications facilities in the Atlantic and Pacific Ocean Regions has been dropping from 75-90 percent in 1987 to about 40 percent in 1993. By 1996, COMSAT's share of available capacity in both the Atlantic and Pacific Ocean Regions will be below 30 percent.

In addition to COMSAT's low and declining market shares, there is clear evidence that COMSAT's cable competitors have (or will soon have) sufficient idle capacity to absorb *all* of COMSAT's traffic to regions easily accessible by cable. Similarly, in geographic market segments that are not easily accessible by cable, existing and planned separate satellite systems would also be able to accommodate COMSAT's service to these regions.

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[144] PanAmSat also explicitly noted that it will not try to compete for service to geographic regions that are served by fiber optic cables (See PAS SEC Form S-l at 43).

IX. OTHER EVIDENCE OF EFFECTIVE COMPETITION

The substantial competition that COMSAT faces in the market for trans-oceanic facilities-based telecommunication services is supported by a number of other measures of effective competition:

- A rapid decline in costs has made fiber optic technology costs comparable with satellite technology;
- COMSAT's customers are large, very sophisticated, and have enormous bargaining power;
- The absence of geographic rate differentiation for major customers further precludes COMSAT from exercising or obtaining market power in smaller geographic areas that face less competition from existing and planned cable systems;
- COMSAT's rates have declined significantly since fiber optic cables and separate satellite systems have emerged; and
- COMSAT has responded to increased competition by introducing a variety of new rates and service offerings.

COST COMPARISON OF SATELLITE AND CABLE TECHNOLOGY

In the ***Interexchange Marketplace*** decision, the FCC compared the relative cost structures of AT&T and its long distance competitors as another measure for assessing the competitiveness of the marketplace.[145] To determine whether the cost of undersea cable technology is competitive with satellite, an "apples to apples" comparison is needed where the two technologies provide an equivalent service in the telecommunications network.[146] The analysis in Exhibit HSH-10 accomplishes this by deriving a measure for direct costs per 64 kbps-

[145] *See Interexchange Marketplace, 6* FCC Rcd at 5885, 5890-91.

[146] Satellite and cable technology costs are compared for simple point-to-point trans-oceanic service. This excludes costs for multiple satellite earth stations as well as costs for cable branches. Furthermore, direct costs do not include interest during construction, administrative and general costs, and cost of tail lines to end users.

equivalent circuit for the two technologies.[147] Direct costs for cable include direct cable construction and operating and maintenance (O&M) costs[148] at an 80 percent capacity fill rate[149] over the useful life. Direct satellite costs[150] include the cost of two earth stations,[151] also at 80 percent capacity utilization over the useful life. The exhibit allows for a comparison of satellite costs and costs for trans-Atlantic and trans-Pacific fiber optic cable systems.

The direct cost of trans-oceanic cable capacity has been declining rapidly since the introduction of the first trans-oceanic fiber optic cable systems in 1988.[152] This decline in costs has moved trans-oceanic fiber optic cable technology from the pilot stage to a point of direct cost competition with satellite technology. Costs for trans-Atlantic fiber-optic cables have decreased from about $800 per circuit and month for TAT-8 in 1988 to approximately $250 per month for TAT-l 1 in 1993. Direct trans-Atlantic cable costs per 64 kbps-equivalent circuit will further decrease to about $115 per month for the planned TAT-12/TAT-13 cable system.

The trans-Pacific cable systems are more expensive than their trans-Atlantic counterparts because of longer distances. However, the cost trend for the trans-Pacific cables is almost identical to that of trans-Atlantic cables. Direct costs per 64 kbps-equivalent circuit decreased from

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147 These cost data only apply to the direct cost of the trans-oceanic component of telecommunications service to and from the U.S. (i.e., from cable landing point to cable landing point and from earth station to earth station). The total cost to the final destination will depend on the length and costs of tail- or transit-lines (i. e., the line from the cable landing point or the earth station to the final destination). Many of the existing and planned cable systems will have a cost advantage in cases where the final destination is "close" to a cable landing point.

148 Direct cable construction costs do not include interest during construction and costs of cable branches, because these cost items will vary from facility to facility and would not represent the "technology cost" of trans-oceanic service. Direct O&M cost only includes the direct cost of operating the facility.

149 Actual fill rates will vary over time and the average fill rate over the useful life of the facility may be lower.

150 These include cost of spacecraft, launch, support, incentives, an insurance-equivalent risk premium of 20 percent of spacecraft and launch cost (if not fully insured), and the cost of two high-capacity earth stations.

151 Although COMSAT does not offer earth station services, it provided estimates for the costs of two hypothetical high-capacity earth stations that could up- and down-link the entire capacity of a satellite.

152 See Exhibit HSH-10.3 at 3-5.

approximately $1,600 per month for the HAW-4/TPC-3 cable in 1988 to about $470 per month for the TPC-4 cable in 1992. The direct cost for the planned TPC-5 cable system will only be about $170 per month per 64 kbps-equivalent circuit.[153]

When the direct costs for fiber optic technology are compared to the direct costs of satellite technology,[154] the extent of recent competition between the two modes becomes very obvious. By 1992, the cost of trans-oceanic cable technology dropped to the point where it is now directly comparable with the direct cost of satellite technology, in the range of $200 to $400 per month per circuit. While cable costs have decreased substantially, direct satellite costs are fairly constant for the 1988 to 1996 time period.

SOPHISTICATION AND BARGAINING POWER OF CUSTOMERS

In the *Interexchange Marketplace* decision, the FCC also looked at the sophistication of the business services customers, their relative bargaining power, trends in market share and pricing, and trade press accounts documenting the success of AT&T's competitors in winning large business customers.[155] The parallel questions in this context are as follows: Are COMSAT's customers sophisticated? Do COMSAT's customers aggressively negotiate rates and are they aware of their competitive options? What kind of negotiating leverage do they have? Is there evidence that COMSAT's customers switch carriers to take advantage of lower rates?

COMSAT's customers are large international telecommunications carriers, multi-national corporations, and major TV networks and broadcasters. There should be little doubt that these customers are highly sophisticated, are aware of their competitive options, and have significant negotiating leverage.

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[153] Note that the cost for the 1993 HAW-S/Pa&m-East cable system is significantly above the cost of other trans-Pacific cables because of its greater length and lower capacity. PacRim-East's "trans-Pacific" capacity going to New Zealand (and Australia) is also only about half of the capacity of the TPC4 and HAW-5 cables.

[154] See Exhibit HSH-10.1 at 3, and Exhibit HSH-10.2 at 2.

[155] ***See Interexchange Marketplace, 6*** FCC Rcd at 5882.

COMSAT's three largest customers account for more than 85 percent of switched voice and private line services. These customers are also COMSAT's competitors. AT&T currently accounts for approximately 50 percent of COMSAT's utilized capacity for switched voice and private line services. AT&T is followed by MCI at about 26 percent and Sprint at approximately 10 percent. These three customers have enormous bargaining power for several reasons:

- Bach of the three carriers dwarfs COMSAT in size and financial resources. In terms of revenues, AT&T is more than 100 times larger than COMSAT; MCI is approximately 20 times larger than COMSAT; and Sprint is about 19 times larger than COMSAT. Even AT&T's, MCI's, and Sprint's operating income exceeded COMSAT's revenues.[156]

- The carriers who are COMSAT's main customers also own the majority of the competing trans-oceanic cable capacity. Because of the idle capacity available on cable facilities today, COMSAT's rates are competing in the short term against the carriers' variable costs on their trans-oceanic cables.

- Only a small fraction of the carriers' traffic volume is along routes without easy access through existing or planned cable systems.

- The carriers are highly sophisticated, leading world-wide telecommunications companies with an excellent understanding of satellite technology.

COMSAT and AT&T negotiated a ten-year inter-carrier agreement in 1987 which established prices for long-term digital switched voice circuits. In 1988, COMSAT reached a similar long-term agreement with MCI. Despite this, AT&T was recently able to renegotiate its agreement with COMSAT obtaining further rate reductions which apply to service from the U.S. to all geographic areas world-wide.[157] AT&T agreed to keep 30 percent of traffic growth on COMSAT through 1995 (consistent with the prior agreement negotiated in 1987) but has the flexibility to redistribute its circuits geographically, an important provision already present in the prior agreement. Within six months of the AT&T agreement, MCI and Sprint had also negotiated new agreements with COMSAT which stipulate the same rate reductions as the

[156] See Table 1 in Section A.

[157] *Intercurrier Agreement between COMSAT and AT&T,* filed with the FCC on August 20, 1993.

agreement with AT&T.[158] The agreed-upon rate level of $350 per month for all ten-year 64 kbps-equivalent bearer circuits starting in 1997 is only about 40 percent of the originally negotiated rate. Despite having the rate "guaranteed" contractually, it will have fallen 60 percent over a ten-year period. The current average rate of $423 for growth circuits already is less than fifty percent of the negotiated rate level when digital service was introduced. This ability of COMSAT's carrier customers to renegotiate downward rates already under contract clearly documents COMSAT's lack of market power. Of note is also the carriers' ability to negotiate the same rate reductions to geographic regions without easy access through cable systems. This indicates that the carriers' bargaining power and the competitive pressure from cables preclude COMSAT from obtaining market power anywhere in the world.

Long-term contracts account for the majority of COMSAT's traffic today. These long-term contracts constrain the firm's ability to raise prices for years to come. While COMSAT cannot raise rates on existing (or new) traffic, customers enjoy numerous options to use alternative facilities for traffic growth.

Absence of Geographic Rate Differentiation

If a company is forced to charge the same rates in all geographic market segments, a high degree of competition in one market segment will constrain market power in less competitive market segments. The absence of geographic rate differentiation will be a particularly effective constraint of market power in less competitive market segments if these segments are small relative to the segments that are more competitive.

The FCC considered "geographic rate averaging" when evaluating AT&T's market power in interstate business services segment in the *Interexchange Marketplace* decision. Geographic rate averaging occurred when customers take service under generic tariffs that provide competitive rates in rural areas that are not served by AT&T's competitors.[159]

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[158] ***Intercarrier Agreement between COMSAT and Sprint,*** **filed with the FCC on December 20, 1993;** ***Intercarrier Agreement between COMSAT and MCI,*** **filed with the FCC on February 22, 1994.**

[159] ***See Interexchange Marketplace, 6*** **FCC Rcd at 5892.**

With very few exceptions, COMSAT's rates for particular services apply uniformly to all areas of the world.[160] In fact, in their recent agreements with COMSAT, AT&T, MCI, and Sprint were able to negotiate that bargained-for rate levels that explicitly apply to all geographical areas of the world. In these agreements, carriers have obtained the flexibility to redistribute their COMSAT circuits geographically.[161]

Geographic market segments not subject to inter-modal competition from existing and planned cable facilities account for less than 10 percent of the total market and only approximately 17 percent of COMSAT's switched voice and private line services. Thus, COMSAT's customers have viable alternatives for the vast majority of their traffic world-wide. An attempt to charge supracompetitive rates would be self-defeating because COMSAT would lose more revenues in the large, highly competitive market segments than it could possibly gain by increasing rates to extract supracompetitive profits from the much smaller segments that may face less competition from existing facilities.

COMSAT RATE TRENDS

The FCC relied on data on pricing trends in its determination of AT&T's market power in the *Interexchange Marketplace* decision.[162] Competition seems to be most evident in industries characterized by dramatic price reductions. The questions to ask are: Have COMSAT's rates fallen over time? If so, to what extent are these price cuts the result of technological changes? How does COMSAT's rate profile compare to the profile of its costs over time?

Exhibit HSH-10.1 shows that direct costs of satellite technology have been fairly stable in the recent past. In comparison, an examination of COMSAT rates shows significant decreases over time. While rates of particular offerings may be unchanged since their initial drop in the mid-1980s, *new* and *lower-priced* services have become available. Digital service has allowed

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[160] However, actual rate levels currently may vary across geographic regions because of volume-related rate blocks and differences between video rates for various transponder types (i.e. global, hemi, and zone beams). Rate blocks are to be phased out in COMSAT's recent contracts with AT&T, MCI, and Sprint.

[161] Seen. 157 and n. 158.

[162] *See Interchange Marketplace, 6* FCC Rcd at 5882, 5889.

COMSAT's customers to decrease their effective costs even beyond the reduction of rates. This is because application of digital compression technology can derive up to five voice-equivalent circuits from each 64 kbps bearer circuit. Because of their attractiveness, service offerings such as digital bearer circuits have now almost completely replaced analog channels.

Exhibit HSH-8 shows typical COMSAT rates. For example, rates for digital 2.048 Mbps[163] switched voice services have decreased from an average of $883 per month when they were introduced in 1988 to $580 in 1993. Under the inter-carrier agreements with AT&T, MCI, and Sprint, rates for long-term carrier commitments will continue to decline to $350 by 1997.[164] Bates for growth circuits were introduced at an average of $423 in 1992. According to the agreements with AT&T, MCI, and Sprint, these rates will also fall to $350 by 1997. Even analog ("FM") voice circuits decreased from $655 per month in 1985 to $420 per month in 1988.

Private line rates in Exhibit HSH-8 show that average rates for monthly 64 kbps international business service (IBS) service have dropped from $842 per month in 1985 to $585 per month in 1990. Seven-year 64 kbps IBS service was introduced in 1987 at a rate of $650 and has dropped to $420 in 1990. Bates for higher-bandwidth T1[165] IBS services have dropped from $524 in 1985 to $304 in mid-1990.

Typical rates for global-beam five-year preemptible[166] 36-MHz video leases for video and audio services have decreased from $100,000 per month in 1985 to $60,700 in 1988. This represents a reduction of 40 percent. Similarly, seven-year zone-beam preemptible video leases have decreased from $46,600 in 1985 to $27,500 in 1988. In 1991, inclined orbit video leases

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[163] A 2.048 Mbps circuit would be equivalent to 30 64 kbps circuits.

[164] Note that digital compression technologies have caused the effective rates per derived voice-equivalent circuit to decline much more rapidly. From 1988 to 1993 average compression on COMSAT's 64 kbps-equivalent circuits used by AT&T increased from 1.1 to 2.6. Accordingly, effective rates for derived voice-equivalent services have fallen 2.4-times faster than the rate decreases for 64 kbps-equivalent bearer circuits for IDR service shown in Exhibit HSH-8.

[165] One T1 circuit is equivalent to 24 64 kbps circuits.

[166] Preemptible video leases are offered on capacity for which other services have the first right of use.

were introduced at significantly discounted rates. Seven-year zone-beam 36MHz transponders, for example, were discounted to $11,000 per month in the first year of the lease and to $22,000 by the third year of a particular lease.

PROLIFERATION OF SERVICES

Although not taken into consideration explicitly in the *Interexchange Marketplace Decision,* service and product feature proliferation trends provide evidence that firms are competing by increasing the variety of product and service offerings. The number and types of services offered by COMSAT have increased dramatically over the past decade. Until 1982 service was only available at one standard monthly rate for analog switched voice and a per-minute rate for occasional-use TV service.

Since then a great number of new rates and service offerings have been introduced. The simple one-rate tariff of the past is now a detailed and multi-faceted rate structure. Among the numerous examples listed in Exhibit HSH-9 are the introduction of various commitment terms, digital switched voice, data and business service, volume discounts, full-time preemptible video leases, discounted inclined orbit video service, digital video rates, self-match booking service, steerable spot beam service, bandwidth on demand, and wideband mobile service.

This rapid proliferation of service offerings not only indicates COMSAT's attempt to retain customers in an increasingly competitive market but also indicates the extent to which the market is evolving due to technological change. In markets characterized by rapid rates of technological change, it is difficult for any firm to exercise market power because a new entrant could quickly capture the market with new technology. For example, the introduction of fiber-optic technology has allowed USISCs to provide services (such as wideband private line services) on trans-oceanic cable systems that previously could only be carried on satellites. Similarly, digital compression allows USISCs to use both satellite and cable capacity more efficiently.

CONCLUSIONS

Costs of trans-oceanic fiber optic cable technology have been decreasing rapidly and have now reached levels that are comparable to (and even below) the costs of satellite technology.

COMSAT's customers are large and sophisticated. COMSAT's customers for video and audio services customers are large broadcast corporations; COMSAT's major customers for switched voice and private line services are the major USISCs, which also own and operate cable facilities that compete with COMSAT. In switched voice and private line services, COMSAT's three major customers account for more than 85 percent of COMSAT's services. Cable ownership and the mere size of these customers gives them enormous bargaining power, which in turn effectively precludes COMSAT from charging supracompetitive prices.

COMSAT has responded to the increasing competitive threat by initiating rate reductions. COMSAT rates for typical switched voice, private line, and video and audio services showed significant declines since 1985 in response to competition from planned fiber optic cable and separate satellite systems. COMSAT has also introduced numerous new services for both switched voice and private line and video and audio services.

X. OVERALL CONCLUSIONS OF THE STUDY

ASSESSING EFFECTIVE COMPETITION

COMSAT faces competition from trans-oceanic cable and separate satellite systems as a result of:

- competition for the loading of existing facilities;
- competition for pre-subscription of planned facilities; and
- competition from the threat of entry.

COMSAT's current market shares for service on existing facilities are generally low and declining; hence it is reasonable to conclude that COMSAT does not have market power. Further, even in small areas where COMSAT has higher market shares, a variety of other compelling factors demonstrate the lack of market power. Competitive alternatives that currently have no share of some market segments effectively preclude COMSAT from exercising or obtaining market power and prevent the firm's control over price.

COMSAT faces effective competition from planned facilities that have not yet gone into service. The services supplied by trans-oceanic facilities-based communication carriers are usually acquired in advance on the basis of long-term contracts signed with customers. An entrant currently attempting to pre-subscribe capacity on a planned or potential new facility exerts considerable competitive pressure on an incumbent's pricing policies even though the new facility's share of the current market segment is still zero. Competition also takes place as the threat of: (1) entry by new trans-oceanic facilities; or (2) existing facilities providing services they have not provided in the past.

MARKET SEGMENTATION

This study disaggregated relevant market segments based on service characteristics and geographic regions to analyze market power. Identifying separate service and geographic market

segments permitted the investigation of the degree of effective competition in the provision of transmission capacity for specific telecommunication services to specific regions in the world.

Given the competitive choices available to customers today, transoceanic facilities-based telecommunications services need only be divided into two separate service market segments: (1) the transmission of trans-oceanic switched voice and private line services; and (2) transmission of trans-oceanic video and audio services. However, in the interest of being conservative, this study also disaggregated the analysis where feasible to examine effective competition separately for switched voice services and private line services.

Both cables and satellites compete for the loading of *switched voice and private line services* on existing facilities. Trans-oceanic facilities-based telecommunication services to and from the U.S. are provided on three main routes:

1. Across the Atlantic to Europe, Africa, and the Middle and Near East (reaching as far as India);
2. To the Caribbean and Latin America; and
3. Across the Pacific to Asia and Oceania (e.g. , Australia and New Zealand).

This study disaggregated each of these three main routes into two geographic market segments: one with intermodal competition from existing and planned cable systems and one without such competition. This geographic market segmentation ensured that cables and satellites are, indeed, close substitutes in the areas classified as subject to intermodal competition from existing and planned facilities.

Competition in facilities-based *video* and *audio services* currently takes place among satellite systems. Although intermodal competition from fiber optic cables is emerging, this study takes a conservative approach and assumes only the existence of intramodal competition for this service segment. Because the analysis of this service segment does not distinguish between those areas served by cable and those that are not, the geographic regions used for analyzing the effective competition for video and audio services correspond to the three main routes.

COMPETITION TO COMSAT IN SWITCHED VOICE AND PRIVATE LINE SERVICES

COMSAT has not benefitted from the overall growth in the market for capacity utilized for switched voice and private line services, nor has it been able to hold on to historical levels of utilized capacity. Total COMSAT capacity utilized for switched voice and private line services declined while the market as a whole grew. As a result, COMSAT's average market share decreased from more than two-thirds in 1988 to approximately one-third in 1993.

COMSAT's market share of utilized trans-oceanic telecommunication capacity for switched voice and private line services to geographic market segments that are easily accessible by existing and planned cable systems has been dropping from the 60 to 85 percent range in 1988 to between 25 and 50 percent in 1993. Higher current market shares to geographic market segments that are not easily accessible by cable are mitigated by competition from planned trans-oceanic cable and satellite facilities and the threat of entry. These market segments account for less than 20 percent of COMSAT's utilized capacity and only 6 percent of the total market for switched voice and private line services.

COMPETITION TO COMSAT IN VIDEO AND AUDIO SERVICES

COMSAT's declining market share of utilized trans-oceanic telecommunication capacity for video and audio services shows the presence of effective competition. Between 1987 and 1996, trans-oceanic market shares as measured in terms of utilized capacity will decline from 100 percent to as low as 40 percent. Market shares for incremental video and audio transponder leases will be below 40 percent in two of three geographic market segments. In terms of revenues, the average world-wide market share is expected to drop to approximately 40 percent.

These market shares are overstated because of limited information on existing and planned separate satellite systems. They will be further reduced by emerging trans-oceanic video and audio services provided by fiber optic cables and entry by new satellite systems.

AVAILABLE FACILITIES AND IDLE CAPACITY

The market for trans-oceanic telecommunication services to and from the U.S. has been growing very rapidly. Rapid growth has facilitated greatly the entry of substantial amounts of new capacity in recent years and even more capacity is planned.

COMSAT's share of existing and planned trans-oceanic telecommunications facilities in the Atlantic and Pacific Ocean Regions has been dropping from 75-90 percent in 1987 to about 40 percent in 1993. By 1996, COMSAT's share of available capacity in both the Atlantic and Pacific Ocean Regions will be below 30 percent.

In addition to COMSAT's low and declining market shares, there is clear evidence that COMSAT's cable competitors have (or will soon have) sufficient idle capacity to absorb easily *all* of COMSAT's traffic. Similarly, in geographic market segments that are not easily accessible by cable, existing and planned separate satellite systems would also be able to accommodate COMSAT's service to these regions.

OTHER MEASURES OF EFFECTIVE COMPETITION

The substantial competition that COMSAT faces in the market for trans-oceanic facilities-based telecommunication services is supported by other evidence of effective competition:

- A rapid decline in costs has made fiber optic technology costs comparable with satellite technology;
- COMSAT's customers are large, very sophisticated, and have enormous bargaining power;
- The absence of geographic rate differentiation for major customers will further preclude COMSAT from obtaining market power even in smaller geographic areas that face less competition from existing and planned cable systems;
- COMSAT's rates have declined significantly since competition from fiber optic cables and separate satellite systems has emerged; and

- COMSAT has responded to increased competition by introducing a variety of new rates and service offerings.

SUMMARY

COMSAT faces substantial effective competition in all geographic and service market segments from existing and planned fiber optic cables and separate satellite facilities, as well as from the threat of entry. Thirty years ago, COMSAT was provided with a monopoly franchise for access to the Intelsat system from the United States. The evidence today demonstrates that this franchise no longer confers upon COMSAT any market power in the provision of trans-oceanic facilities-based telecommunications services. In an environment characterized by a substantial and rapidly increasing level of effective competition, immediate streamlining of regulatory oversight should be considered.

SECTION D

ABOUT THE AUTHORS

HENDRIK S. HOUTHAKKER

Hendrik S. Houthakker is a senior advisor to The *Brattle Group* and the Henry Lee Professor of Economics at Harvard University. Since joining the Harvard faculty in 1960, he has worked in a number of areas, including economic theory, econometrics and economic policy. Professor Houthakker has applied econometric techniques to consumer demand, international economic relations, and commodity markets. From 1971 to 1992 he was Editor of The *Review of Economics and Statistics.* In 1987-88 he was Acting Chairperson of the department.

Professor Houthakker served as one of the three members of President Nixon's Council of Economic Advisers from 1969 to 1971. Previously, he had served on the staff of President Johnson's Council of Economic Advisers. He has been a consultant to several government agencies and private organizations, and a member of the National Commission on Supplies and Shortages (197577).

Professor Houthakker completed his graduate work at the University of Amsterdam in 1949. After conducting economic research at Cambridge University (1949-51), he started teaching at the University of Chicago (1952-53). Prior to joining the Harvard faculty in 1960, he also taught at Stanford University (1954-60) and was Visiting Professor at the University of Tokyo (1955), at M.I.T. (1957-58) and at Harvard (1958-59).

With S. J. Prais, he is coauthor of "The Analysis of Family Budgets" (1955). His monograph, "Consumer Demand in the United States, 1929-1970," with Lester D. Taylor, was published in 1966; a second and enlarged edition appeared in 1970. Two other monographs are "Economic Policy for the Farm Sector" (1967) and "The World Price of Oil" (1976). He has also written numerous articles.

Professor Houthakker is a member of the National Academy of Sciences, the American Academy of Arts and Sciences and the American Economic Association (AEA), from which he received the John Bates Clark medal in 1963; he was a Vice President of the AEA in 1972. He is a Fellow of the Econometric Society, of which he was President in 1967, and corresponding member of the Royal Netherlands Academy of Sciences. He has received honorary doctorates from the University of Amsterdam and the University of Fribourg, and is an Adjunct Scholar of the American Enterprise Institute. In addition, he is a public director of the New York Futures Exchange.

THE BRATTLE GROUP

The Brattle Group provides economic, management, and environmental counsel throughout the U.S. and abroad. Clients include major corporations, law firms, trade associations, and government agencies. *The Brattle Group's* practice focuses on providing assistance to corporations and their legal counsel in the areas of regulated industries, antitrust and transportation economics, finance, damage assessment, technology and R&D management, and energy and environmental issues. Members of *The Brattle Group* have provided economic counsel and have been expert witnesses in many of the major litigation efforts of the past decade. Assignments have involved numerous industries such as telecommunications, airlines, railroads, ocean shipping, natural gas and electric utilities, pipelines and natural resources. The *Brattle Group's* analyses in this study were performed by William B. Tye and Johannes P. Pfeifenberger.

William B. Tye is a Principal at *The Brattle Group.* He received a B.A. in economics from Emory University and a Ph.D. in economics from Harvard University in 1969. Since teaching economics for three years at United States Air Force Academy, he has been working as an economic consultant. In August 1990, he formed *The Brattle Group* with five colleagues. Much of his consulting career has involved regulated industries. He has testified before numerous regulatory agencies and courts involving issues of rates, economics, management, and competition. Dr. Tye has authored or co-authored over 100 papers and publications, including four books on regulated industries. The books include *Regulatory Risk: Economic Principles and Applications to Natural Gas Pipelines and Other Industries* (Kluwer Academic Publishers, 1993) and *The Transition to Deregulation* (Quorum Books, 1991). The papers have appeared in such publications as *The American Economic Review, The Yale Journal on Regulation, Energy Law Journal, The Rand Journal of Economics,* and *Public Utilities Fortnightly*. He speaks frequently at seminars and meetings on regulatory issues sponsored by organizations such as the National Association of Regulatory Utility Commissioners, the Federal Energy Bar Association, and the Antitrust Section of the American Bar Association.

Johannes P. Pfeifenberger is an associate at *The Brattle Group* with expertise in the areas of economics and business strategy. He has been involved in various litigation matters and proceedings in regulated industries, presented testimony for filing in a utility's rate case, and worked on projects involving testimony on the economic implications of deregulation, innovative rate structures and incentive regulation. Mr. Pfeifenberger received an M.A. in International Economics and Finance from Brandeis University and holds an M.S. *(Diplom Ingenieur)* in Electrical Engineering from the University of Technology in Vienna, Austria. In 1990, Mr. Pfeifenberger participated in the Program of International Business at Sophia University in Tokyo, Japan.

EXHIBITS

EXHIBIT HSH-1

GEOGRAPHIC MARKET SEGMENTS

Exhibit HSH- 1

Geographic Market Segments

Country	Geographic Market Segment
1 Anguilla	1 Caribbean/Latin America
2 Antigua	1 Caribbean/Latin America
3 Argentina	1 Caribbean/Latin America
4 Aruba	1 Caribbean/Latin America
5 Bahamas, The	1 Caribbean/Latin America
6 Barbados	1 Caribbean/Latin America
7 Bermuda	1 Caribbean/Latin America
8 Brazil	1 Caribbean/Latin America
9 British Virgin Islands	1 Caribbean/Latin America
10 Chile	1 Caribbean/Latin America
11 Colombia	1 Caribbean/Latin America
12 Costa Rica	1 Caribbean/Latin America
13 Cuba	1 Caribbean/Latin America
14 Dominica	1 Caribbean/Latin America
15 Dominican Republic	1 Caribbean/Latin America
16 El Salvador	1 Caribbean/Latin America
17 French Antilles	1 Caribbean/Latin America
18 Grenada	1 Caribbean/Latin America
19 Guadeloupe	1 Caribbean/Latin America
20 Guatemala	1 Caribbean/Latin America
21 Guyana	1 Caribbean/Latin America
22 Haiti	1 Caribbean/Latin America
23 Honduras	1 Caribbean/Latin America
24 Jamaica	1 Caribbean/Latin America
25 Montserrat	1 Caribbean/Latin America
26 Netherlands Antilles	1 Caribbean/Latin America
27 Nicaragua	1 Caribbean/Latin America
28 Panama	1 Caribbean/Latin America
29 Paraguay	1 Caribbean/Latin America
30 St. Kitts & Nevis	1 Caribbean/Latin America
31 St. Lucia	1 Caribbean/Latin America
32 St. Vincent	1 Caribbean/Latin America
33 Trinidad and Tobago	1 Caribbean/Latin America
34 Uruguay	1 Caribbean/Latin America
35 Venezuela	1 Caribbean/Latin America
36 Australia	2 East Asia/Oceania
37 Brunei	2 East Asia/Oceania
38 China	2 East Asia/Oceania
39 Fiji	2 East Asia/Oceania
40 Hong Kong	2 East Asia/Oceania
41 Indonesia	2 East Asia/Oceania
42 Japan	2 East Asia/Oceania
43 Korea, South	2 East Asia/Oceania
44 Malaysia	2 East Asia/Oceania
45 New Zealand	2 East Asia/Oceania
46 Papua New Guinea	2 East Asia/Oceania
47 Phillipines	2 East Asia/Oceania

48 Singapore	2 East Asia/Oceania
49 Taiwan	2 East Asia/Oceania
50 Thailand	2 East Asia/Oceania
51 US. (Guam)	2 East Asia/Oceania
52 U.S. (Saipan)	2 East Asia/Oceania
53 Vietnam	2 East Asia/Oceania
54 Afghanistan	3 Europe/Mediterranean/Middle East
55 Algeria	3 Europe/Mediterranean/Middle East
56 Austria	3 Europe/Mediterranean/Middle East
57 Bangladesh	3 Europe/Mediterranean/Middle East
58 Belgium	3 Europe/Mediterranean/Middle East
59 CIS/USSR (Armenia)	3 Europe/Mediterranean/Middle East
60 CIS/USSR (Azerbaijan)	3 Europe/Mediterranean/Middle East
61 CIS/USSR (Belarus)	3 Europe/Mediterranean/Middle East
62 CIS/USSR (Estonia)	3 Europe/Mediterranean/Middle East
63 CIS/USSR (Georgia)	3 Europe/Mediterranean/Middle East
64 CIS/USSR (Kazakhstan)	3 Europe/Mediterranean/Middle East
65 CIS/USSR (Kyrghzstan)	3 Europe/Mediterranean/Middle East
66 CIS/USSR (Latvia)	3 Europe/Mediterranean/Middle East
67 CIS/USSR (Liihuania)	3 Europe/Mediterranean/Middle East
68 CIS/USSR (Moldava)	3 Europe/Mediterranean/Middle East
69 CIS/USSR (Russian Federation)	3 Europe/Mediterranean/Middle East
70 CIS/USSR (Tajikistan)	3 Europe/Mediterranean/Middle East
71 CIS/USSR (Turkmenistan)	3 Europe/Mediterranean/Middle East
72 CIS/USSR (Ukraine)	3 Europe/Mediterranean/Middle East
73 CIS/USSR (Uzbekistan)	3 Europe/Mediterranean/Middle East
74 Cyprus	3 Europe/Mediterranean/Middle East
75 Czechoslovakia	3 Europe/Mediterranean/Middle East
76 Denmark	3 Europe/Mediterranean/Middle East
77 Djibouti	3 Europe/Mediterranean/Middle East
78 Egypt	3 Europe/Mediterranean/Middle East
79 Finland	3 Europe/Mediterranean/Middle East
80 France	3 Europe/Mediterranean/Middle East
81 Germany	3 Europe/Mediterranean/Middle East
82 Gibraltar	3 Europe/Mediterranean/Middle East
83 Greece	3 Europe/Mediterranean/Middle East
84 Hungary	3 Europe/Mediterranean/Middle East
85 India	3 Europe/Mediterranean/Middle East
86 Ireland	3 Europe/Mediterranean/Middle East
87 Israel	3 Europe/Mediterranean/Middle East
88 Italy	3 Europe/Mediterranean/Middle East
89 Lebanon	3 Europe/Mediterranean/Middle East
90 Libya	3 Europe/Mediterranean/Middle East
91 Liechtenstein	3 Europe/Mediterranean/Middle East
92 Luxembourg	3 Europe/Mediterranean/Middle East
93 Malta	3 Europe/Mediterranean/Middle East
94 Morocco	3 Europe/Mediterranean/Middle East
95 Nepal	3 Europe/Mediterranean/Middle East
96 Netherlands	3 Europe/Mediterranean/Middle East
97 Norway	3 Europe/Mediterranean/Middle East
98 Oman	3 Europe/Mediterranean/Middle East
99 Pakistan	3 Europe/Mediterranean/Middle East
100 Poland	3 Europe/Mediterranean/Middle East
101 Portugal	3 Europe/Mediterranean/Middle East
102 Romania	3 Europe/Mediterranean/Middle East
103 Saudi Arabia	3 Europe/Mediterranean/Middle East
104 Spain	3 Europe/Mediterranean/Middle East
105 Spain (Canary Islands)	3 Europe/Mediterranean/Middle East
106 Sri Lanka	3 Europe/Mediterranean/Middle East

107 Sweden	3 Europe/Mediterranean/Middle East
108 Switzerland	3 Europe/Mediterranean/Middle East
109 Syria	3 Europe/Mediterranean/Middle East
110 Tunisia	3 Europe/Mediterranean/Middle East
111 Turkey	3 Europe/Mediterranean/Middle East
112 United Kingdom	3 Europe/Mediterranean/Middle East
113 Yemen	3 Europe/Mediterranean/Middle East
114 Yugoslavia (Bosnia)	3 Europe/Mediterranean/Middle East
115 Yugoslavia (Croatia)	3 Europe/Mediterranean/Middle East
116 Yugoslavia (Serbia)	3 Europe/Mediterranean/Middle East
117 Yugoslavia (Slovenia)	3 Europe/Mediterranean/Middle East
118 Antartica	4 Rest of Latin America
119 Belize	4 Rest of Latin America
120 Bolivia	4 Rest of Latin America
121 Cayman Islands	4 Rest of Latin America
122 Curacao	4 Rest of Latin America
123 Ecuador	4 Rest of Latin America
124 French Guiana	4 Rest of Latin America
125 Martinique	4 Rest of Latin America
126 Peru	4 Rest of Latin America
127 Suriname	4 Rest of Latin America
128 Turks and Caicos Islands	4 Rest of Latin America
129 Albania	5 Rest of AOR
130 Angola	5 Rest of AOR
131 Ascension Island	5 Rest of AOR
132 Bahrain	5 Rest of AOR
133 Benin	5 Rest of AOR
134 Botswana	5 Rest of AOR
135 Bulgaria	5 Rest of AOR
136 Burkina Faso	5 Rest of AOR
137 Burundi	5 Rest of AOR
138 Cameroon	5 Rest of AOR
139 Cape Verde	5 Rest of AOR
140 Central African Republic	5 Rest of AOR
141 Chad	5 Rest of AOR
142 Congo	5 Rest of AOR
143 Diego Garcia	5 Rest of AOR
144 Eritrea	5 Rest of AOR
145 Ethiopia	5 Rest of AOR
146 Gabon	5 Rest of AOR
147 Gambia, The	5 Rest of AOR
148 Ghana	5 Rest of AOR
149 Greenland	5 Rest of AOR
150 Guinea	5 Rest of AOR
151 Guinea – Bissau	5 Rest of AOR
152 Iceland	5 Rest of AOR
153 Iran	5 Rest of AOR
154 Iraq	5 Rest of AOR
155 Ivory Coast	5 Rest of AOR
156 Jordan	5 Rest of AOR
157 Kenya	5 Rest of AOR
158 Kuwait	5 Rest of AOR
159 Lesotho	5 Rest of AOR
160 Liberia	5 Rest of AOR
161 Madagascar	5 Rest of AOR
162 Malawai	5 Rest of AOR
163 Mali	5 Rest of AOR
164 Mauritania	5 Rest of AOR
165 Mauritius	5 Rest of AOR

166 Mozambique	5 Rest of AOR
167 Namibia	5 Rest of AOR
168 Niger	5 Rest of AOR
169 Nigeria	5 Rest of AOR
170 Qatar	5 Rest of AOR
171 Rwanda	5 Rest of AOR
172 Sao Tome and Principe	5 Rest of AOR
173 Senegal	5 Rest of AOR
174 Seychelles	5 Rest of AOR
175 Sierra Leone	5 Rest of AOR
176 Somalia	5 Rest of AOR
177 South Africa	5 Rest of AOR
178 Sudan	5 Rest of AOR
179 Swaziland	5 Rest of AOR
180 Tanzania	5 Rest of AOR
181 Togo	5 Rest of AOR
182 Uganda	5 Rest of AOR
183 United Arab Emirates	5 Rest of AOR
184 Zaire	5 Rest of AOR
185 Zamibia	5 Rest of AOR
186 Zimbabwe	5 Rest of AOR
187 French Polynesia	6 Rest of POR
188 Kampuchea	6 Rest of POR
189 Korea, North	6 Rest of POR
190 Laos	6 Rest of POR
191 Macau	6 Rest of POR
192 Mongolia	6 Rest of POR
193 Myanmar (Burma)	6 Rest of POR
194 Nauru	6 Rest of POR
195 New Caledonia	6 Rest of POR
196 Tahiti	6 Rest of POR
197 Tonga	6 Rest of POR
198 U.S. (Am. Samoa)	6 Rest of POR
199 U.S. (Ebeye)	6 Rest of POR
200 U.S. (Kosrae)	6 Rest of POR
201 U.S. (Majuro)	6 Rest of POR
202 U.S. (Marshall Islands)	6 Rest of POR
203 U.S. (Micronesia/Ponape)	6 Rest of POR
204 US. (Midway Island)	6 Rest of POR
205 U.S. (Palau)	6 Rest of POR
206 U.S. (Truk)	6 Rest of POR
207 US. (Wake Island)	6 Rest of POR
208 U.S. (Yap)	6 Rest of POR
209 Western Samoa	6 Rest of POR